Clean Energy Systems
Mendota Carbon Negative Energy Project

Risk Assessment and Risk Workshop

Risk is an inevitable component of all industrial activity regardless of project size, complexity, or visibility. A project that seeks to achieve significant technological or industrial advancements may face higher levels of risk than a project that makes little to no scientific progress. In this sense, the presence of risk may represent an important opportunity, as much as an operational concern.

CES does not seek to avoid risk but rather to identify and ensure it is managed effectively and efficiently. For this, CES is employing a two-part strategy of Risk Assessment and Risk Management. Risk Assessment includes risk identification (as to presence) and evaluation (as to nature and severity). Risk Management includes risk response (as to actions taken based on a completed risk assessment) and risk mitigation (as to reduction in the likelihood and/or severity of risk events based on the corrective actions taken).

Identifying risk events and corrective actions as required, if events occur, will minimize disruption to a project, the public, and the environment. The depth of analysis and the complexity and cost of the resulting risk management plan will differ from project to project, based on the nature and collective potential or likely consequences of the risk. In our efforts to 'tailor' our Risk Management plan, we must first adequately identify and evaluate risk for the new project. We respectfully ask for your support in the development of our Project's Risk Assessment.

The CES Mendota Project is a first of its kind facility that integrates proven biomass gasification, CES' oxy-combustion, and carbon capture and sequestration (CCS) technologies. The novel and complex facility relies upon many components, which in turn rely upon many different areas of expertise. Risks can arise in many and sometimes unexpected areas: highly specific and technical risks include the temperature, pressure, flow rate, constancy/intermittency, and chemical composition of the delivered CO_2; and the short- and long-term effects of these factors upon well and rock characteristics both near the wellbore and farther away. Just as significant to project success are risks in areas such as communications, social, and public-perception – which may affect the complex interactions of a diverse project work team, local support or opposition, and/or project permitting. It is important that all risks be identified and evaluated on the same basis.

The Risk Assessment has three key goals:

1) Identify all significant risks to project success
2) Prioritize them for response, by evaluating their Likelihood and Severity of causing negative impact
3) Identify likely responses to reduce Likelihood and/or Severity

Experts are essential for identifying and evaluating risks associated with the pioneering technology employed in both the CES oxy-combustion powerplant and the carbon sequestration process. There are no documented industry tables of "event frequency" to provide the foundation for a comprehensive, integrated project management plan poised to succeed. Our most powerful asset is the professional judgment and vision of those who are best informed about this project, and about similar settings and activities. Experts possess specialized knowledge that is critical to planning and executing the project. Ensuring all significant risks are identified and evaluated requires the synthesis of structured input from a wide range of experts from varying organizations.

Experts invited to the CES Mendota Project Risk Assessment Workshop have specialized knowledge in technical areas such as: Geologic Characterization and Simulation; Reservoir and Caprock Geology and Petrophysics; Well Drilling and Completions; Monitoring, Verification, Accounting (MVA); and Project Management, Operations, and HSE. Risks associated with matters involving: Legal, Permitting and Regulatory risk; External Affairs and Public Outreach; will be assessed in a separate forum.

During the risk assessment process, all participants will receive a grounding in the oxy-combustion process, well construction, sub-surface description, monitoring plan, as well as instruction in the risk-assessment technique. Then, during the Workshop, the CES-Schlumberger team will walk through a preselected list of risk elements known as Features, Events, and Processes (FEPs). Experts will be asked to evaluate identified risk elements in terms of the Likelihood and Severity of the negative impacts with which they may be associated. Likelihood is assigned a value of 1 through 5 based on rough expected recurrence intervals of negatively impacting events. Severity is evaluated regarding impacts to defined project goals such as health, safety, environment, cost, and others, is also valued from 1 to 5.

After the workshop, the Project team will evaluate the results of the Risk Survey and classify risks into high, medium, or low risk categories. All high-risk scenarios will be mitigated. The steps the team will take to manage, monitor, avoid, or minimize those risks will be detailed in the Project Risk Management Plan. This will include items such as a Testing and Monitoring Plan, Corrective Action Plan, and Emergency and Remedial Response plan.

The expected outcome of the risk assessment is a comprehensive and rational basis for decision support in all critical project management areas, including:

- the complex interactions and consequences among oxy-combustion power generation, carbon capture and sequestration processes
- coordination for upset/off-spec conditions and the procedures to accommodate injection interruptions for maintenance, data acquisition, or other purposes, by either the power plant or the CO_2 storage facility
- coordination among plant outflow requirements, well construction, injection, and storage
- complimentary permitting submissions and interactions with the various governmental agencies
- assuring safe, environmentally sound operations for the life of the project